

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-257758

(43)Date of publication of application : 24.09.1999

(51)Int.Cl.

F24H 9/00

(21)Application number : 10-059398

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(22)Date of filing : 11.03.1998

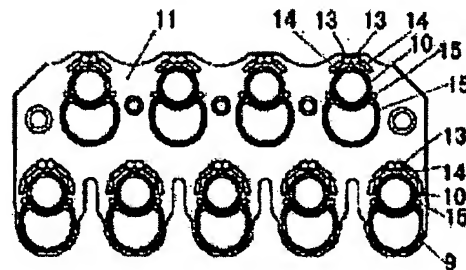
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(54) HEAT EXCHANGER

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent fluid standing in unused one of a pair of fluid circuits formed vertically from boiling.

SOLUTION: The heat exchanger comprises a pair of fluid channels 9, 10 formed vertically wherein the joint of lower tube 9 is recessed, the upper tube 10 has diameter smaller than that of the lower tube 9, and the lower chord of the upper tube 10 is fitted to the recess of the lower tube 9 and brazed each other. According to the structure, brazing material spreads well to the joint through gravity and capillarity and since a heat transfer fin 11 as well as the upper and lower tubes 9, 10 are jointed surely, quantity of heat being transferred by both tubes 9, 10 is increased. Furthermore, heat transmittance is enhanced by increasing current velocity in the upper tube 10 at the time of using the function of the lower tube 9 and the quantity of heat being transferred by the lower tube 9 can be increased.



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CLAIMS

[Claim(s)]

[Claim 1] A heat exchange apparatus with which it is the heat exchanger which joined two different channels heated by combustion part via a filter medium to an up-and-down couple, and made a heat transfer fin penetrate, and a joined part of a pipe of said lower part side stream way serves as a concave.

[Claim 2] The heat exchange apparatus according to claim 1 with which a crevice which is a joined part of a pipe of a lower part side stream way agrees with a last quarter of a pipe of an upper part side stream way.

[Claim 3] The heat exchange apparatus according to claim 1 or 2 which made a path of a pipe of a channel by the side of the upper part smaller than a path of a pipe of a channel by the side of a lower part.

[Claim 4] The heat exchange apparatus according to claim 1, 2, or 3 which provided a thermal insulation part in the circumference of a pipe of said upper part side stream way of a heat transfer fin which a pipe of an upper part side stream way penetrates.

[Claim 5] A heat exchange apparatus which it is the heat exchanger which joined two different channels heated by combustion part via a filter medium to an up-and-down couple, and made a heat transfer fin penetrate, and said joined part is an uneven type, and made a path of a pipe of a channel by the side of the upper part smaller than a path of a pipe of a channel by the side of a lower part.

[Claim 6] A heat exchange apparatus which two different channels heated by combustion part are the heat exchangers which adjoined up and down via a septum and made a heat transfer fin penetrate, and said septum considered it as a concave, and made area of a channel by the side of the upper part smaller than area of a channel by the side of a lower part.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] In the water heater of a bath which follows and burns and has a function and heating functions, one source of combustion heat exists and this invention relates to the heat exchange apparatus with which it is satisfied of said function.

[0002]

[Description of the Prior Art] Conventionally, the heat exchanger which can heat two kinds of fluids simultaneously by one combustion part is adopted as compound water heaters, such as a hot-water-supply bath device which can perform operation of hot water supply and a bath. This kind of conventional heat exchange apparatus had some which are indicated to JP,H9-145162,A. The heat transfer fin 3 of two or more sheets which contacts the hydraulic circuits 1 and 2 of the diameter of the same of an up-and-down couple, and is common was made to penetrate, as this heat exchange apparatus shows to drawing 12, heat was radiated through the joined part 4 in the fluid which is using the heat which the hydraulic circuit of the function which is not used

receives, and the rise of the fluid temperature of those, who do not use it, is controlled. Although at least one side is transforming these trend-of-the-world object circuits 1 and 2, it is a diameter of the same, and as it is not placed between the joined parts 4 by the filter medium, they are made to contact.

[0003]

[Problem(s) to be Solved by the Invention] However, especially in the composition of the above-mentioned conventional heat exchanger, if a predetermined combustion amount is exceeded, the heat quantity to the lower joint 1 near a flame will increase to heat the fluid which passes the upper joint 2. Since the rate of flow will fall and a heat transfer coefficient will fall at this time if the flow area of the upper joint 2 is large, the heat transfer amount from the lower joint 1 to the upper joint 2 cannot secure enough, but the fluid temperature of the lower joint 1 rises, and since it boils therefore, it is hard to say that it is not necessarily enough in respect of endurance and safety as a device.

[0004] Since control of stopping a combustion amount in order to control a rise in heat was introduced, it had produced, also when the original performance was not fully able to be demonstrated.

[0005] Although the filter medium 5 was not made to be placed between junction of up-and-down both the pipes 1 and 2 but junction of up-and-down both the pipes 1 and 2 and the heat transfer fin 3 was considered as the composition between which the filter medium 5 is made to be placed, it was dramatically difficult not to make the filter medium 5 intervene between the lower joint 1 and the upper joint 2, but to realize field contact.

[0006]

[Means for Solving the Problem] In order that this invention may solve an aforementioned problem, two different hydraulic circuits heated by combustion part are made into an up-and-down couple. It is the heat exchanger which made a heat transfer fin penetrate, and is a heat exchange apparatus making a path of a pipe by the side of the upper part smaller than a path of a pipe by the side of a lower part, making a joined part of a pipe by the side of a lower part into a concave, and carrying out low junction with a last quarter of a pipe by the side of the upper part. It is a heat exchange apparatus forming two different hydraulic circuits and making a cross-section area of a hydraulic circuit by the side of the upper part smaller than a cross-section area of a hydraulic circuit by the side of a lower part by a septum used as a concave.

[0007] According to the above-mentioned invention, when only one function is used in a heat exchange apparatus provided with two functions with one can, boil of a fluid in a pipe in the direction of a function which is not used can be controlled.

[0008]

[Embodiment of the Invention] This invention is the heat exchanger which joined two different channels heated by the combustion part via the filter medium to the up-and-down couple, and made the heat transfer fin penetrate, and is the heat exchange apparatus which the joined part of the pipe of said lower part side stream way made the concave.

[0009] The crevice which is a joined part of the pipe of a lower part side stream way is the heat exchange apparatus according to claim 2 which agrees with the last quarter of the pipe of an upper part side stream way.

[0010] It is the heat exchange apparatus according to claim 3 which made the path of the pipe of the channel by the side of the upper part smaller than the path of the pipe of the channel by the side of a lower part.

[0011] It is the heat exchange apparatus according to claim 4 which provided the thermal insulation part in the circumference of said upper joint of the heat transfer fin which an upper joint penetrates.

[0012] It is the heat exchanger which joined two different channels heated by the combustion part via the filter medium to the up-and-down couple, and made the heat transfer fin penetrate, and said joined part is an uneven type and is a 1-tin 2 circuit heat exchange apparatus of Claim 5 which made the path of the pipe of the channel by the side of the upper part smaller than the path of the pipe of the channel by the side of a lower part.

[0013] Two different channels heated by the combustion part are the heat exchangers which

adjoined up and down via the septum and made the heat transfer fin penetrate, and a septum is a 1-tin 2 circuit heat exchange apparatus of Claim 6 which considered it as the concave and made area of the channel by the side of the upper part smaller than the area of the channel by the side of a lower part.

[0014]

[Example] Hereafter, working example of this invention is described using Drawings.

[0015] (Working example 1) Drawing 1 to drawing 7 is working example 1 of this invention, for example, is what showed typically the composition which included the heat exchanger of this invention in the hot-water-supply bath device, and a sectional view of a fin-pipes heat exchanger. As for the hot-water-supply bath device of this example, 6 is a heat exchanger. The can 8 which passes the exhaust heat which 7 is a burner which is a combustion part and is generated by combustion of the burner 7. It has composition which penetrated the heat transfer fin 11 as an up-and-down couple so that the flow of combustion gas may be met in the bath tubes 10 (upper joint) which are the hot-water pipe 9 (lower joint) in which the upper part carried out the concave by the hydraulic circuit provided in the can 8, and a tube which is another hydraulic circuit.

Here, the filter-medium hole A13 which can insert the two filter media 12 in the heat transfer fin 11 of the upper part of the bath tubes 10, and the thermal insulation hole 14 which is thermal insulation parts were formed, and the filter-medium hole B15 which inserts the two filter media 12 in the heat transfer fin 11 of the right and left of the shoulder of the hot-water pipe 9 further is formed.

[0016] The filter medium provided in the filter-medium hole A13 fuses the gap of the joined part 16 of the concave of the hot-water pipe 9 upper part of drawing 2, and the last quarter of the bath-tubes 10 lower part, and it is buried with the filter medium 12 and joined. At this time, a gap is set as the value (about 40 micrometers) in which the fused filter medium 12 flows the best according to gravity and capillarity. Since the filter-medium hole A13 is formed symmetrically, the heat transfer fin 11 and the bath tubes 10 can carry out low attachment good. Since the filter-medium hole B15 is similarly formed symmetrically, the heat transfer fin 11 and the hot-water pipe 9 can carry out low attachment good.

[0017] SUBJECT in the conventional composition is in the state where only one function is used among two functions, and when a predetermined combustion amount is exceeded, it is that the heat transfer amount which leads becomes insufficient and the fluid of the function which is not used boils the surface of action between both the pipelines of an up-and-down couple. As a means to solve this SUBJECT, change a hydraulic circuit and the touch area of the hot-water pipe 9 and the bath tubes 10 is expanded, and the joined part 16 is certainly contacted with the filter medium 12, and a heat transfer amount is made to increase. By making the flow area of the bath tubes 10 small, and speeding up the internal rate of flow, it can consider making the heat transfer amount from the hot-water pipe 9 to the bath tubes 10 increase.

[0018] Then, while the filter medium 12 which melted since the path was larger than the upper joint whose lower joints which are the hot-water pipe 9 are the bath tubes 10 turns to the joined part 16 according to the composition of this invention, The shape of the joined part 16 of the hot-water pipe 9 which is a lower joint is a concave, a gap shall be about 40 micrometers and, in the surroundings, the filter medium 12 has cheap composition by gravity and capillarity.

Therefore, since it can contact certainly even if the field of the joined part 16 is somewhat uneven, a heat transfer area does not decrease. When performing bath individual operation, the water staying of the hot-water pipe 9 boils in many cases, but in the rate of flow of the fluid which passes the bath tubes 10 by making the path of the bath tubes 10 smaller than the hot-water pipe 9, efficiency of heat transfer increases early. When heating the hot-water pipe 9 at the time of hot-water-supply individual operation and demonstrating the maximum hot-water-supply capability, a possibility that the heat quantity from the heat transfer fin 11 to the bath tubes 10 will increase, and the bath tubes 10 will boil increases, but the quantity which receives heat by the thermal insulation hole 14 and the filter-medium hole A13 can be restricted.

[0019] Therefore, it is the composition of drawing 2, when bath operation is performed, for example, without hot water supply carrying out, the quantity of heat heated by the hot-water

pipe 9 from the burner 7 is the same as a conventional example, but it can contact certainly via the filter medium 12 of the hot-water pipe 9 and the bath tubes 10. A heat transfer coefficient improves by making the path of the pipe of the bath tubes 10 smaller than the path of the pipe of the hot-water pipe 9 furthermore, controlling the heat quantity of the bath tubes 10 by restricting a heat transfer amount in the thermal insulation hole 14 and the filter-medium hole A13, and speeding up the rate of flow in a pipe. And the hot-water-supply water which carried out temperature up will radiate heat to bath water through the surface of action of both the pipes 9 and 10, and the heat release's will increase from the conventional composition. Therefore, it is lost that a fluid boils, even if the temperature up of hot-water-supply water is controlled and a combustion amount increases.

[0020] That is, since the temperature up of the fluid which is stagnating in the state where only one function is used among two functions is controlled, it can attain scale occurrence prevention of both the pipes 9 and 10, and prolongation-of-life-ization of a heat exchanger. It is not necessary to restrict the output of the burner 7, the performance of a device can fully demonstrate in connection with the rise in heat of the fluid which is stagnating, and the displeasure given to the user is canceled.

[0021] The following effects are acquired by having had composition of a hydraulic circuit like drawing 1. Since the height of a pipe becomes low as compared with the composition which joins the conventional round pipe in order to make the hot-water pipe 9 into a concave, miniaturization of the can 8 is realized. Since the exhaust back pressure of combustion gas will be reduced if the can 8 becomes compact, miniaturization of the burner 7 is also attained. Since the hot section of the heat transfer fin 11 which touches both the pipes 9 and 10 decreases with the increase in the heat transfer amount between both the pipes 9 and 10, oxidation of the heat transfer fin 11 is controlled. Therefore, the endurance and reliability of the heat transfer fin 11 improve.

[0022] Since up-and-down both the pipes 9 and 10 touch via the filter medium 12, even if one of hydraulic circuits expand thermally them, they ease the stress from which the filter medium 12 is transmitted to the pipe of another side. Therefore, since a pipe changes flexibly also by the operating condition to which excessive heat stress is added, a crack of the can 8 can be prevented, and endurance also improves.

[0023] In drawing 1 and drawing 2, although it is an example made to change the sectional shape of 9 of a hot-water pipe into a concave, it is not a limitation of this shape, and if it is composition like drawing 4 changed, for example until the hot-water pipe 9 covered the half grade of the bath tubes 10, a still better effect can be demonstrated.

[0024] In this example, with a press, pressurizing machining of the circular pipe was carried out, and modification of the sectional shape of the hot-water pipe 9 of drawing 2 and drawing 4 manufactured it. In addition, the hydraulic circuit of sectional shape as shown in drawing 2 and drawing 4 also with a drawing processing pipe or an extruding pipe is producible.

[0025] In the composition of drawing 2 and drawing 4, although the lower part of the hydraulic circuit of an up-and-down couple is used as the hot-water pipe 9 and the upper part is made into the bath tubes 10, the effect same also as a heating hot water circuit is acquired in the lower part.

[0026] Although the example applied to the hot-water-supply bath device explained this invention in this example, it is applicable also to a hot-water-supply heater and a heating bath device.

[0027] Although the example around which the filter medium 12 turns to the joined part 16 which carried out the concave of the hot-water pipe 9 and the bath tubes 10 by gravity and capillarity was shown, Still better junction is possible by forming the low sheet 17 in the joined part 16 beforehand, or having applied the filter medium, or forming the cylindrical filter medium 12, as shown in drawing 6 as shown in drawing 5.

[0028] By the way, although the shape of the joined part 16 has explained the example with which the last quarter of the bath tubes 10 and the concave of the hot-water pipe 9 agree, It is shown in drawing 7 and the concave of the hot-water pipe [like] 9 demonstrates the effect as the surroundings that the lower part of the bath tubes 10 of the filter medium 12 is also the same good to the joined part 16 even when becoming an inverse triangle and agreeing, with an inverse

triangle.

[0029](Working example 2) Drawing 8 and drawing 9 are working example 2 of this invention, and show the fin-pipes composition of this invention. The purpose and effect of this invention are the same as what was shown in working example 1, and both differences in the composition of this example and working example 1 are having changed the sectional shape of the hot-water pipe 9 and the bath tubes 10, and having expanded the contact length of the joined part 16.

[0030]The thing of working example 1 and identical codes has the same structure, and explanation is omitted. In the composition of drawing 8, the pars plana 18 and the crevice 19 are formed, the joined part 16 of the bath tubes 10 forms the pars plana 18 and the crevice 19 similarly, and the sectional shape of the joined part 16 of the hot-water pipe 9 joins both the pipes 9 and 10 via the filter medium 12. While the filter medium 12 which melted since the path was larger than the upper joint whose lower joints which are the hot-water pipe 9 are the bath tubes 10 here turns to the joined part 16, it is possible to enlarge the connection length of the joined part 16 by transforming up-and-down both the pipes 9 and 10. The gap of the joined part 16 of heat transfer of the fluids inside both pipes is about 40 micrometers.

Since the heat transfer coefficient of the water in which the construction material of a pipe and a filter medium will stagnate with copper if a fluid is water is overwhelmingly worse, the heat transfer inhibition by the existence of a filter medium does not pose a problem so much.

[0031]Therefore, it is the composition of drawing 8, when bath operation is performed, for example, without hot water supply carrying out, the quantity of heat heated by the hot-water pipe 9 from the burner 7 is the same as a conventional example, but it can contact certainly via the filter medium 12 of the hot-water pipe 9 and the bath tubes 10, and the length of the joined part 16 can also be lengthened certainly. Furthermore the path of the pipe of the bath tubes 10 is made smaller than the path of the pipe of the hot-water pipe 9, and the hot-water-supply water which improved and carried out temperature up of the heat transfer coefficient radiates heat to bath water through the surface of action of both the pipes 9 and 10 by controlling the heat quantity of the pipe of the bath tubes 10, and speeding up the rate of flow in a pipe by restricting a heat transfer amount in the thermal insulation hole 14 and the filter-medium hole A13. The heat release will increase from the conventional composition. Therefore, it is lost that a fluid boils, even if the temperature up of hot-water-supply water is controlled and a combustion amount increases.

[0032]That is, since the temperature up of the fluid which is stagnating in the state where even the inside of two functions is using only the function is controlled, it can attain scale occurrence prevention of both the pipes 9 and 10, and prolongation-of-life-ization of a heat exchanger. It is not necessary to restrict the output of the burner 7, the performance of a device can fully demonstrate in connection with the rise in heat of the fluid which is stagnating, and the displeasure given to the user is canceled.

[0033]The following effects are acquired by having had composition of a hydraulic circuit like drawing 8. Since both the height of a hot-water pipe, 9, and the bath tubes 10 becomes low as compared with the conventional composition, miniaturization of the can 8 is realized. Since the exhaust back pressure of combustion gas will be reduced if the can 8 becomes compact, miniaturization of the burner 7 is also attained. Since the length of the joined part 16 of a tube cross section can be lengthened overwhelmingly, the heat transfer amount of up-and-down both pipes can be increased, and since the hot section of the heat transfer fin 11 which touches both the pipes 9 and 10 decreases, oxidation of the heat transfer fin 11 is controlled. Therefore, the endurance and reliability of the heat transfer fin 11 improve.

[0034]Since up-and-down both the pipes 9 and 10 touch via the filter medium 12, even if one of hydraulic circuits expand thermally them, they ease the stress from which the filter medium 12 is transmitted to the pipe of another side. Therefore, since a pipe changes flexibly also by the operating condition to which excessive heat stress is added, a crack of the can 8 can be prevented, and endurance also improves.

[0035]In drawing 8, although the sectional shape of the joined part 16 is an example changed into the forms of the pars plana 18 and the crevice 19, it is not a limitation of this shape, and as

shown in drawing 9, even if it is a concavo-convex waveform, the same effect can be demonstrated, for example.

[0036]As shown in drawing 8 and drawing 9, in this example, the hydraulic circuit which changes [make] sectional shape also with press forming, a drawing processing pipe, or an extruding pipe can manufacture a circular pipe.

[0037]Although the example which performs junction of the hot-water pipe 9 and the bath tubes 10 by capillarity using a thing with the cylindrical filter medium 12 was shown, junction is possible, even if have applied the filter medium to the joined part 16 beforehand, a low sheet is provided or it provides the cylindrical filter medium.

[0038]In the composition of drawing 8, although the lower part of the hydraulic circuit of an up-and-down couple is used as the hot-water pipe 9 and the upper part is made into the bath tubes 10, the effect same also as a heating hot water circuit is acquired in the lower part.

[0039]Although the example applied to the hot-water-supply bath device explained this invention in this example, it is applicable also to a hot-water-supply heater and a heating bath device.

[0040](Working example 3) Drawing 10 and drawing 11 are working example 3 of this invention, and show the fin-pipes composition of this invention. the purpose and effect of this invention are the same as what was shown in working example 1, and the difference in composition with this example, working example 1, or working example 2 is having composition which made two different channels the hot-water-supply channel 20 and the bath channel 21, and separated both channels by the septum 22 of one sheet.

[0041]The thing of working example 1 and identical codes has the same structure, and explanation is omitted. In the composition of drawing 10 and drawing 11, shape of the septum 22 of separating the hot-water-supply channel 20 and the bath channel 21 is made into a concave. Here, the lower hot-water-supply channel 20 makes it larger than the area of the upper bath channel 21. Since the interval of both channels is only the board thickness of the septum 22, it can do heat transfer distance short as compared with low junction of pipes.

[0042]Therefore, are the composition of drawing 10 and drawing 11, when bath operation is performed, for example, without hot water supply carrying out, the quantity of heat heated from the burner 7 in the hot-water-supply channel 20 is almost the same as a conventional example, but. The hot-water-supply channel 20 and the bath channel 21 adjoin via the septum 22, and make area of the bath channel 21 further smaller than the hot-water-supply channel 20, The hot-water-supply water which improved and carried out temperature up of the heat transfer coefficient radiates heat to bath water only through the septum 22 by controlling the heat quantity of the bath channel 21 and speeding up the rate of flow in a pipe by restricting a heat transfer amount in the thermal insulation hole 14 and the filter-medium hole A13. The heat release will increase from the conventional composition. Therefore, it is lost that a fluid boils, even if the temperature up of hot-water-supply water is controlled and a combustion amount increases.

[0043]That is, since the temperature up of the fluid which is stagnating in the state where only one function is used among two functions is controlled, it can attain scale occurrence prevention of both the pipes 9 and 10, and prolongation-of-life-ization of a heat exchanger. It is not necessary to restrict the output of the burner 7, the performance of a device can fully demonstrate in connection with the rise in heat of the fluid which is stagnating, and the displeasure given to the user is canceled.

[0044]The following effects are acquired by having had composition of a channel like drawing 10 and drawing 11. Since the height of the hot-water-supply channel 20 becomes low as compared with the conventional composition, miniaturization of the can 8 is realized. Since the exhaust back pressure of combustion gas will be reduced if the can 8 becomes compact, miniaturization of the burner 7 is also attained. Since the hot section of the heat transfer fin 11 which touches both the channels 20 and 21 decreases with the increase in the heat transfer amount between both the channels 20 and 21, oxidation of the heat transfer fin 11 is controlled. Therefore, the endurance and reliability of the heat transfer fin 11 improve.

[0045]The sectional shape shown by drawing 10 and drawing 11 is an example, is not a limitation of this shape, and even if it is the shape of the joined part 16 of drawing 8 or drawing 9, it can

demonstrate the same effect, for example.

[0046]The channel of drawing 10 and drawing 11 can be manufactured with a drawing processing pipe or an extruding pipe.

[0047]In the composition of drawing 10 and drawing 11, although both the channel bottom is made into hot water supply and the upper part is made into the bath, the effect same also as a heating hot water circuit is acquired in the bottom.

[0048]Although the example applied to the hot-water-supply bath device explained this invention in this example, it is applicable also to a hot-water-supply heater and a heating bath device.

[0049]

[Effect of the Invention]According to the heat exchange apparatus of this invention, the following effect is acquired so that clearly from the above explanation.

[0050](1) It is the heat exchanger which made two different hydraulic circuits the up-and-down couple, and made the heat transfer fin penetrate, and the efficiency of heat transfer between an upper joint and a lower joint is improved by changing the joined part of the lower joint of the hydraulic circuit of an up-and-down couple into a concave. When carrying out low junction temporarily with such shape, while a filter medium is [the surroundings] dramatically cheap to a joined part and can join to it certainly by gravity and capillarity, when using the function of a lower joint, heat transfer of the heat of an upper joint is carried out to a lower joint, and boil of an upper joint can be prevented. When using the function of an upper joint, heat transfer of the heat of a lower joint is carried out to an upper joint, and boil of a lower joint can be prevented. That is, even if a combustion amount increases in the state where only one function is used among two functions, boil of the fluid of the function which is not used can be prevented.

[0051]While occurrence prevention of a scale and prolongation-of-life-ization of a heat exchanger are realized, the performance which a device has is fully demonstrated and the displeasure given to the user is canceled by this effect. Miniaturization of a can and a combustion part is realized and the endurance and reliability of a heat transfer fin improve by oxidation of a heat transfer fin being controlled. Since a hydraulic circuit changes into a heat exchanger flexibly also by the operating condition to which excessive heat stress is added, a crack of a can can be prevented, and endurance also improves.

[0052](2) When the last quarter of an upper joint agrees in the joined part which carried out the concave of the lower joint, supposing it can make the surface of action of a joined part large, it can enlarge efficiency of heat transfer and it uses a round pipe for an upper joint, while piping of an upper joint will have been conventional method, it can carry out easily. When carrying out low junction, while a filter medium can join to a joined part certainly at a low price in the surroundings, even if a combustion amount increases in the state where only one function is used among two functions, boil of the fluid of the function which is not used can be prevented.

[0053]Occurrence prevention of a scale and prolongation-of-life-ization of a heat exchanger are realized by this effect, and an efficient and reliable device can be provided. The performance which a device has is fully demonstrated and the displeasure given to the user is canceled. In addition, miniaturization of a can and a combustion part is realized and the endurance and reliability of a heat transfer fin improve by oxidation of a heat transfer fin being controlled. Since a hydraulic circuit changes into a heat exchanger flexibly also by the operating condition to which excessive heat stress is added, a crack of a can can be prevented, and endurance also improves.

[0054](3) The filter medium which flows from the upper part side because the path of an upper joint makes it smaller than the path of a lower joint is easy to be introduced into a joined part, and gravity and capillarity can realize good junction. By making the path of an upper joint small, when the function of an upper joint ends by a small flow rate, since the rate of flow in an upper joint can be sped up, the heat transfer amount from a lower joint to an upper joint can be increased, and boil of the fluid in a lower joint can be prevented.

[0055]Occurrence prevention of a scale and prolongation-of-life-ization of a heat exchanger are realized by this effect, and an efficient and reliable device can be provided. The performance which a device has is fully demonstrated and the displeasure given to the user is canceled.

[0056]Since the upper joint is circular, a pressure drop can be made into the minimum, and it

becomes possible to pour the fluid of a large flow rate easily to a lower joint.

[0057](4) When using the function of a lower joint for the circumference of an upper joint by providing a thermal insulation part, a thermal insulation part can insulate heat-receiving from the fin of an upper joint, and boil of the fluid in an upper joint can be prevented.

[0058]Occurrence prevention of the scale in bath tubes and prolongation-of-life-ization of a heat exchanger are realized by this effect, and an efficient and reliable device can be provided. The performance which a device has is fully demonstrated and the displeasure given to the user is canceled.

[0059](5) It can become large about the touch area of up-and-down both pipes by joining the joined part of the hydraulic circuit of an up-and-down couple with an uneven type, and a heat transfer amount can be made to increase. Good junction is [that the filter medium which flows from the upper part side is easy to be introduced into a joined part] realizable because the path of an upper joint makes it smaller than the path of a lower joint. By making the path of an upper joint small, when the function of an upper joint ends by a small flow rate, since the rate of flow in an upper joint can be sped up, the heat transfer amount from a lower joint to an upper joint can be increased, and boil of the fluid in a lower joint can be prevented. Even if a combustion amount increases in the state where only one function is used among two functions, boil of the fluid of the function which is not used can be prevented.

[0060]While occurrence prevention of a scale and prolongation-of-life-ization of a heat exchanger are realized, the performance which a device has is fully demonstrated and the displeasure given to the user is canceled by this effect. Miniaturization of a can and a combustion part is realized and the endurance and reliability of a heat transfer fin improve by oxidation of a heat transfer fin being controlled. Since a hydraulic circuit changes into a heat exchanger flexibly also by the operating condition to which excessive heat stress is added, a crack of a can can be prevented, and endurance also improves.

[0061](6) It becomes possible for the distance between up-and-down both channels to serve as the shortest with constituting the channel of an up-and-down couple from one pipe via the septum which carried out the concave, and to enlarge a touch area again, and the heat transfer amount is increased. By making the path of an upper joint small, when the function of an upper part channel ends by a small flow rate, since the rate of flow in an upper part channel can be sped up, the heat transfer amount from a bottom channel to an upper part channel can be increased, and boil of the fluid in a bottom channel can be prevented. Even if a combustion amount increases in the state where only one function is used among two functions, boil of the fluid of the function which is not used can be prevented.

[0062]While occurrence prevention of a scale and prolongation-of-life-ization of a heat exchanger are realized, the performance which a device has is fully demonstrated and the displeasure given to the user is canceled by this effect. Miniaturization of a can and a combustion part is realized and the endurance and reliability of a heat transfer fin improve by oxidation of a heat transfer fin being controlled. Since a hydraulic circuit changes into a heat exchanger flexibly also by the operating condition to which excessive heat stress is added, a crack of a can can be prevented, and endurance also improves.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The fin-pipes sectional view of the heat exchange apparatus of working example 1 of this invention

[Drawing 2] The expanded sectional view of the fin pipes

[Drawing 3] The perspective view showing the entire configuration of the fin pipes

[Drawing 4] Another expanded sectional view of the fin pipes

[Drawing 5] Another expanded sectional view of the fin pipes

[Drawing 6] Other expanded sectional views of the fin pipes

[Drawing 7] The expanded sectional view of further others of the fin pipes

[Drawing 8] The fin-pipes expanded sectional view of the heat exchange apparatus of working example 2 of this invention

[Drawing 9] Another expanded sectional view of the fin pipes

[Drawing 10] The fin-pipes expanded sectional view of the heat exchange apparatus of working example 3 of this invention

[Drawing 11] Another expanded sectional view of the fin pipes

[Drawing 12] The fin-pipes expanded sectional view of the conventional heat exchange apparatus

[Description of Notations]

6 Heat exchanger

7 Combustion part

9 Lower part side stream way

10 Upper part side stream way

11 Heat transfer fin

12 Filter medium

14 Thermal insulation part

16 Joined part

22 Septum

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

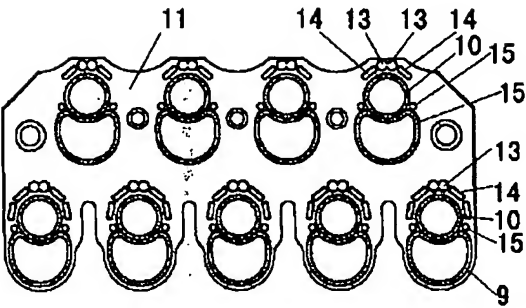
2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DRAWINGS

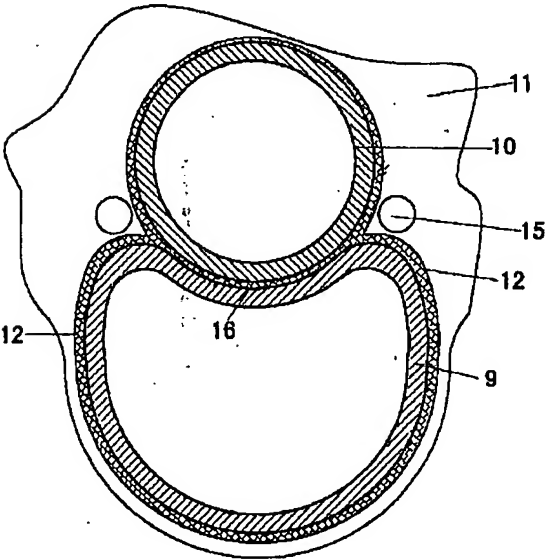
[Drawing 1]

- 9 下方側流路
- 10 上方側流路
- 11 伝熱フィン
- 14 遮熱部



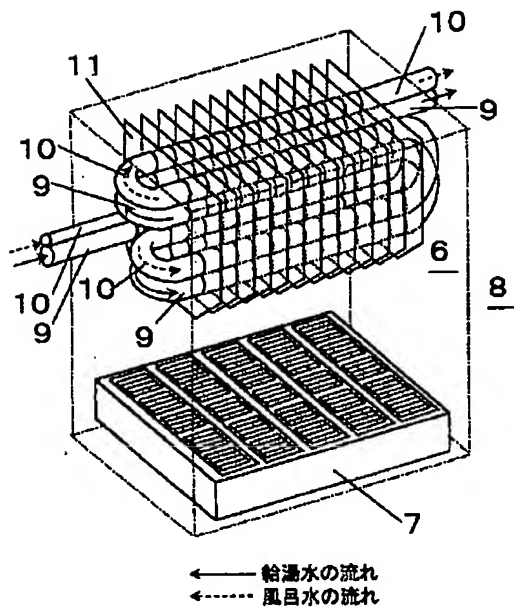
[Drawing 2]

12 ロウ材

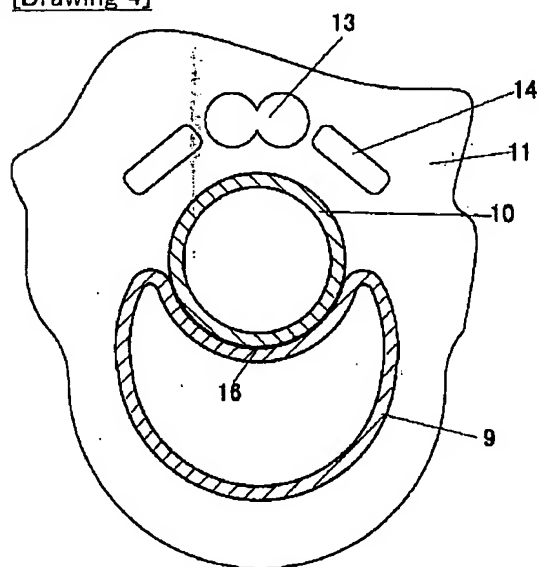


[Drawing 3]

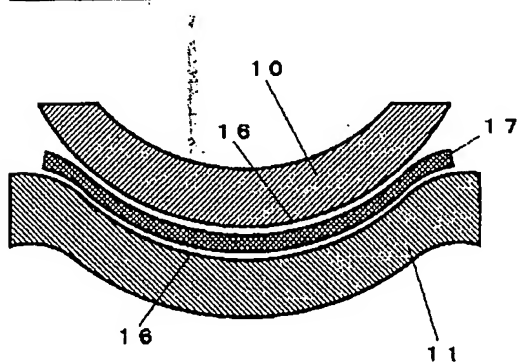
6 熱交換器
7 燃焼部



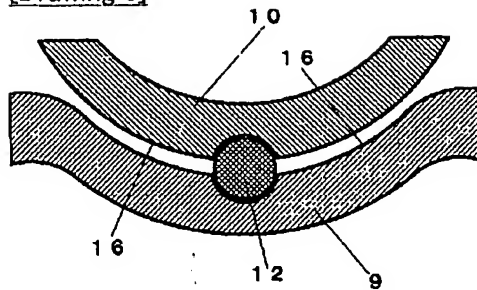
[Drawing 4]



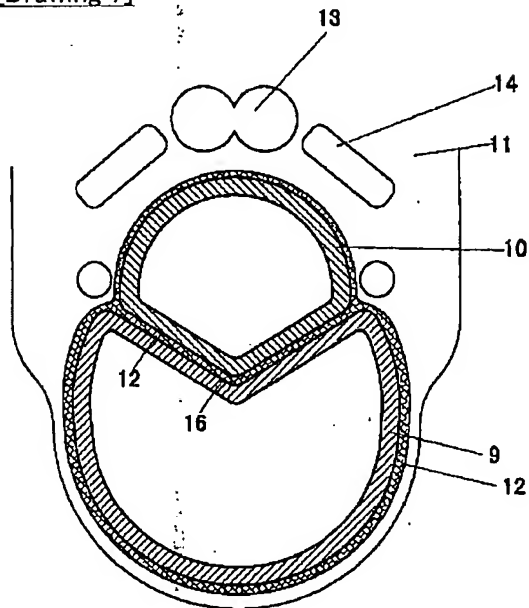
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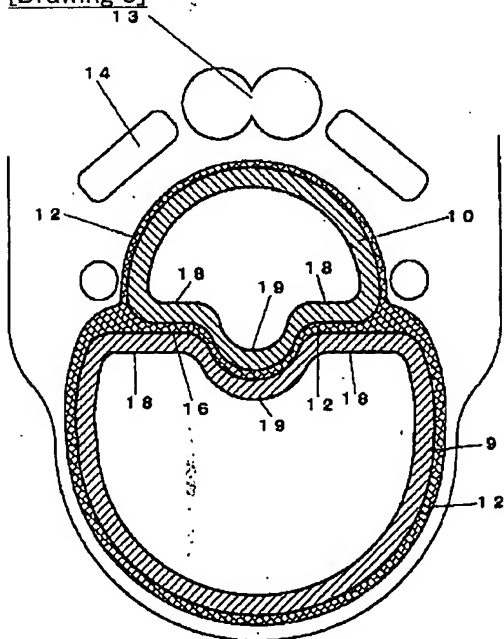
[Drawing 6]



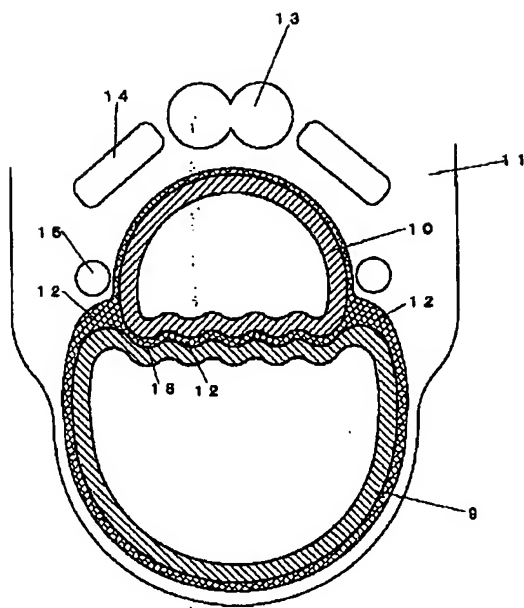
[Drawing 7]



[Drawing 8]

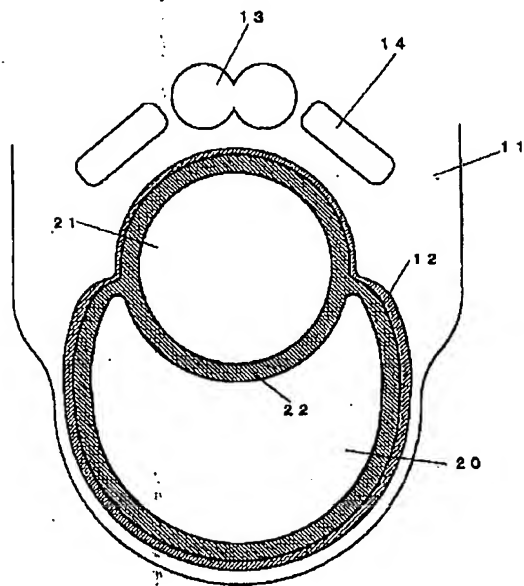


[Drawing 9]

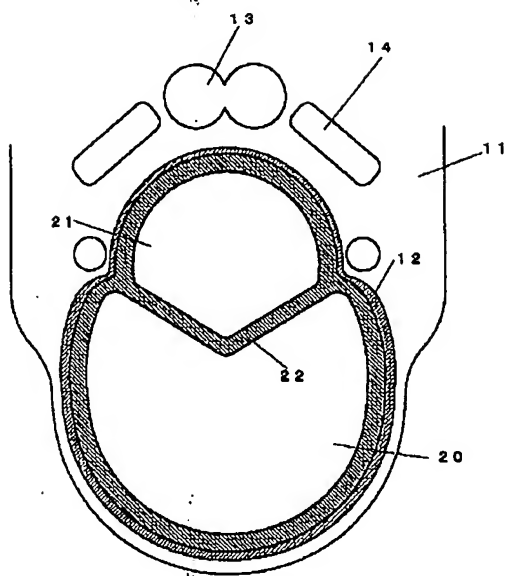


[Drawing 10]

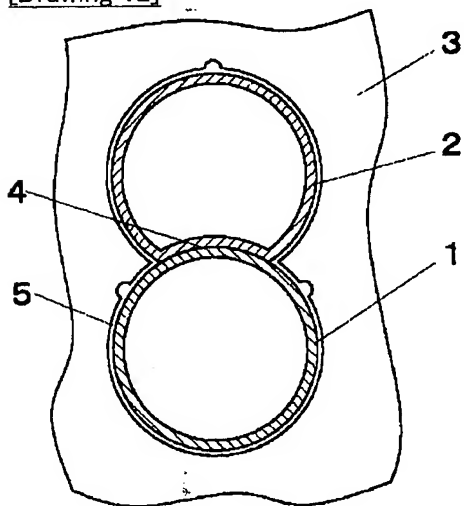
20 給湯流路
21 風呂流路
22 隔壁



[Drawing 11]



[Drawing 12]



[Translation done.]

(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開平11-257758

(43)公開日 平成11年(1999) 9月24日

(51)Int.Cl.⁹

F 2 4 H 9/00

識別記号

F I

F 2 4 H 9/00

A

審査請求 未請求 請求項の数6 O L (全 9 頁)

(21)出願番号 特願平10-59398

(22)出願日 平成10年(1998) 3月11日

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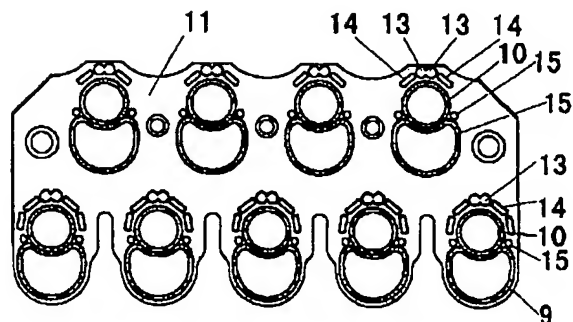
(54)【発明の名称】 熱交換装置

(57)【要約】

【課題】 上下一對に形成された流体回路の中、使用しない方の回路内で滞留している流体が沸騰することを防止する。

【解決手段】 上下一對の流路9、10で構成される熱交換器において、流路9、10の下管9の接合部16を凹型にするとともに、上管10の径を下管9の径より小さくし、上管10の下弦が下管9の凹部と合致し両管同士がロウ材を介して接合している。この構成により、接合部にロウ材が重力と毛細管現象により良好にまわり、上下両管9、10の接合と伝熱フィン11との接合を確実に行うことができるため、両管9、10の伝熱量は増加する。さらに、下管9の機能を使用する際に上管10内の流速を速めることで熱伝達率が向上し、下管9からの伝熱量を向上することができる。

9 下方側流路
10 上方側流路
11 伝熱フィン
14 遮熱部



【特許請求の範囲】

【請求項1】 燃焼部によって加熱される二つの異なる流路を上下一対にロウ材を介して接合し伝熱フィンを貫通させた熱交換器であって、前記下方側流路の管の接合部が凹型となる熱交換装置。

【請求項2】 下方側流路の管の接合部である凹部が上方側流路の管の下弦と合致する請求項1記載の熱交換装置。

【請求項3】 上方側の流路の管の径を下方側の流路の管の径より小さくした請求項1または2記載の熱交換装置。

【請求項4】 上方側流路の管が貫通する伝熱フィンの前記上方側流路の管の周囲に遮熱部を設けた請求項1、2または3記載の熱交換装置。

【請求項5】 燃焼部によって加熱される二つの異なる流路を上下一対にロウ材を介して接合し伝熱フィンを貫通させた熱交換器であって、前記接合部が凹凸型であり上方側の流路の管の径を下方側の流路の管の径より小さくした熱交換装置。

【請求項6】 燃焼部によって加熱される二つの異なる流路が隔壁を介して上下に隣接し伝熱フィンを貫通させた熱交換器であって、前記隔壁が凹型とし、上方側の流路の面積を下方側の流路の面積より小さくした熱交換装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は風呂の追い焚き機能や暖房機能を有する給湯機において、燃焼熱源が1カ所存在し、前記機能を満足する熱交換装置に関するものである。

【0002】

【従来の技術】 従来、一つの燃焼部によって2種類の流体を同時に加熱できる熱交換器は、給湯と風呂の運転ができる給湯風呂装置などの複合給湯機に採用されている。この種の従来の熱交換装置は特開平9-145162号公報に記載されているようなものがあった。この熱交換装置では、図12に示す様に、上下一対の同一径の流体回路1と2を接触させて共通する複数枚の伝熱フィン3を貫通させ、使用しない機能の流体回路が受ける熱を、使用している流体に接合部4を通じて放熱し、使用しない方の流体温度の上昇を抑制している。この時流体回路1と2は少なくとも一方が変形しているが、同一径であり接合部4にはロウ材が介在しないようにして接触させている。

【0003】

【発明が解決しようとする課題】 しかしながら、上記従来の熱交換器の構成では、特に上管2を通過する流体を加熱したいときに、所定の燃焼量を超えると火炎に近い下管1への受熱量が多くなる。この時、上管2の流路面積が大きいと流速が落ち熱伝達率が低下するため、下管

1から上管2への伝熱量が十分確保できず下管1の流体温度は上昇し、沸騰することもあり、そのため、装置としては耐久性と安全性の点で必ずしも十分とは言い難いものであった。

【0004】 また、温度上昇を抑制するために、燃焼量を抑えるといった制御を導入していたため、本来の性能を十分に発揮できない場合も生じていた。

【0005】 さらに、上下両管1と2の接合にはロウ材5を介在させず、上下両管1、2と伝熱フィン3の接合はロウ材5を介在させる構成としているが、下管1と上管2の間にロウ材5を介在させず面接触を実現することは非常に困難であった。

【0006】

【課題を解決するための手段】 本発明は上記課題を解決するために、燃焼部によって加熱される二つの異なる流体回路を上下一対にして、伝熱フィンを貫通させた熱交換器であって、上方側の管の径を下方側の管の径より小さくし、下方側の管の接合部を凹型にし上方側の管の下弦とロウ接合することを特徴とする熱交換装置である。さらに、凹型となる隔壁により、二つの異なる流体回路を形成し上方側の流体回路の断面積を下方側の流体回路の断面積より小さくすることを特徴とする熱交換装置である。

【0007】 上記発明によれば、一つの缶体で二つの機能を備えた熱交換装置において、一つの機能のみを使用したときに、使用しない機能の方の管内流体の沸騰を抑制することができる。

【0008】

【発明の実施の形態】 本発明は、燃焼部によって加熱される二つの異なる流路を上下一対にロウ材を介して接合し伝熱フィンを貫通させた熱交換器であって、前記下方側流路の管の接合部が凹型とした熱交換装置である。

【0009】 また、下方側流路の管の接合部である凹部が上方側流路の管の下弦と合致する請求項2記載の熱交換装置である。

【0010】 また、上方側の流路の管の径を下方側の流路の管の径より小さくした請求項3記載の熱交換装置である。

【0011】 また、上管が貫通する伝熱フィンの前記上管の周囲に遮熱部を設けた請求項4記載の熱交換装置である。

【0012】 また、燃焼部によって加熱される二つの異なる流路を上下一対にロウ材を介して接合し伝熱フィンを貫通させた熱交換器であって、前記接合部が凹凸型であり上方側の流路の管の径を下方側の流路の管の径より小さくした請求項5の1缶2回路熱交換装置である。

【0013】 また、燃焼部によって加熱される二つの異なる流路が隔壁を介して上下に隣接し伝熱フィンを貫通させた熱交換器であって、隔壁が凹型とし、上方側の流路の面積を下方側の流路の面積より小さくした請求項6

の1缶2回路熱交換装置である。

【0014】

【実施例】以下、本発明の実施例について図面を用いて説明する。

【0015】（実施例1）図1から図7は本発明の実施例1であり、例えば本発明の熱交換器を給湯風呂装置に組み込んだ構成を模式的に示したものと、フィンパイプ熱交換器の断面図である。本実施例の給湯風呂装置は、6は熱交換器であり、7は燃焼部であるバーナであり、バーナ7の燃焼により発生する排熱を通過させる缶体8と、缶体8に設けた流体回路で上部が凹型をした給湯管9（下管）と、もう一つの流体回路である円管である風呂管10（上管）を、燃焼ガスの流れに沿う如く、上下一対として伝熱フィン11を貫通した構成となっている。ここで、風呂管10の上部の伝熱フィン11にはロウ材12を2本挿入できるロウ材穴A13と、遮熱部である遮熱穴14が設けられ、さらに給湯管9の肩の左右の伝熱フィン11にロウ材12を2本挿入するロウ材穴B15を設けている。

【0016】図2の給湯管9上部の凹型と風呂管10下部の下弦の接合部16の間隙は、ロウ材穴A13に設けていたロウ材が溶融し、ロウ材12で埋まり、接合されている。この時、間隙は溶融したロウ材12が重力と毛細管現象によって最も良好に流動する値（約40 μ m）に設定される。また、左右対称にロウ材穴A13が設けられているので、伝熱フィン11と風呂管10は良好にロウ付けできる。同じく、左右対称にロウ材穴B15が設けられているので、伝熱フィン11と給湯管9は良好にロウ付けできる。

【0017】従来の構成での課題は、二つの機能のうち一つの機能のみを使っている状態で、所定の燃焼量を超えると、上下一対の両管路間の接触領域を通じての伝熱量が不十分となり、使用しない機能の流体が沸騰することである。この課題を解決する手段として、流体回路を変形させ給湯管9と風呂管10の接触面積を拡大すると共に接合部16をロウ材12により確実に接触させ伝熱量を増加させることと、風呂管10の流路面積を小さくし内部流速を速めることで、給湯管9から風呂管10への伝熱量を増加させることが考えられる。

【0018】そこで本発明の構成によれば、給湯管9である下管が風呂管10である上管よりも径が大きいので溶けたロウ材12が接合部16へまわるとともに、下管である給湯管9の接合部16の形状が凹型であり間隙を40 μ m程度とし重力と毛細管現象でロウ材12がまわりやすい構成としている。したがって接合部16の面が多少凹凸していても確実に接触できるため、伝熱面積が減少することがない。また、風呂単独運転を行うときは、給湯管9の滞留水が沸騰することが多いが、風呂管10の径を給湯管9よりも小さくすることで風呂管10を通過する流体の流速が早くなり、伝熱効率が増加す

る。さらに、給湯単独運転時の給湯管9を加熱し最大給湯能力を発揮する際には、風呂管10への伝熱フィン11からの受熱量が多くなり風呂管10の沸騰する可能性が増加するが、遮熱穴14とロウ材穴A13により受熱する量を制限できる。

【0019】従って、図2の構成で、例えば給湯は行わずに風呂運転を行った場合、バーナ7から給湯管9に加熱される熱量は従来例と同じであるが、給湯管9と風呂管10とのロウ材12を介して確実に接触できる。さらに風呂管10の管の径を給湯管9の管の径より小さくし、遮熱穴14とロウ材穴A13で伝熱量を制限することにより風呂管10の受熱量を制御し管内流速を速めることで熱伝達率が向上する。そして昇温した給湯水が両管9、10の接触領域を通じて風呂水へ放熱し、その放熱量は従来の構成より増えることとなる。従って、給湯水の昇温は抑制され、燃焼量が増加しても流体が沸騰することはなくなる。

【0020】つまり、二つの機能のうち一つの機能のみを使っている状態で、滞留している流体の昇温は抑制されるため、両管9、10のスケール発生防止と熱交換器の延命化を図ることができる。また、滞留している流体の温度上昇に伴って、バーナ7の出力を制限する必要もなく、装置の性能が十分に発揮でき、ユーザーに与えた不快感は解消される。

【0021】さらに、図1のような流体回路の構成にしたことによって、以下のような効果が得られる。従来の丸管を接合する構成に比較して、給湯管9を凹型とするため管の高さが低くなるため、缶体8のコンパクト化が実現される。缶体8がコンパクトになれば、燃焼ガスの排気抵抗が低減されるため、バーナ7のコンパクト化も可能となる。また、両管9、10間の伝熱量の増加に伴い、両管9、10に接する伝熱フィン11の高温部が減るため、伝熱フィン11の酸化が抑制される。従って、伝熱フィン11の耐久性と信頼性が向上する。

【0022】また、上下両管9、10はロウ材12を介して接触しているため、どちらか一方の流体回路が熱膨張しても、ロウ材12が他方の管に伝わる応力を緩和する。従って、過度の熱応力が加わる運転条件でも柔軟に管が変形するため、缶体8の割れが防止できると共に、耐久性も向上する。

【0023】なお、図1、図2において、給湯管の9の断面形状を凹型に変形させた一例であるが、この形状の限りではなく、例えば、給湯管9が風呂管10の半分程度を覆うまで変形させた図4の様な構成であればさらに良好な効果が発揮できる。

【0024】図2、図4の給湯管9の断面形状の変形は、本実施例では円形管をプレスによって加圧加工して製造した。この他にも、引き抜き加工管や押し出し加工管でも図2、図4に示すような断面形状の流体回路は作製可能である。

【0025】図2、図4の構成において、上下一対の流体回路の下部を給湯管9、上部を風呂管10としているが、下部を暖房温水回路としても同様の効果が得られる。

【0026】また、本実施例では、本発明を給湯風呂装置に適用した例で説明したが、給湯暖房装置、暖房風呂装置にも適用できる。

【0027】また、給湯管9と風呂管10の凹型をした接合部16にロウ材12が重力と毛細管現象で回り込む例を示したが、図5に示すように接合部16に予めロウシート17を設けるかもしくはロウ材を塗布していたり、図6に示すように棒状ロウ材12を設けることで更に良好な接合が可能である。

【0028】ところで、接合部16の形状が風呂管10の下弦と給湯管9の凹型とが合致する例について説明してきたが、図7に示しような給湯管9の凹型が逆三角形で風呂管10の下部も逆三角形となり合致する場合でもロウ材12は接合部16に良好にまわり同様の効果を発揮するものである。

【0029】（実施例2）図8、図9は本発明の実施例2であり、本発明のフィンパイプ構成を示したものである。本発明の目的と効果は、実施例1で示したものと同じであり、本実施例と実施例1との構成における違いは、給湯管9と風呂管10の断面形状を共に変形し、接合部16の接触長さを拡大していることである。

【0030】なお、実施例1と同一符号のものは同一構造を有し、説明は省略する。図8の構成において、給湯管9の接合部16の断面形状は扁平部18と凹部19を設けたものであり、風呂管10の接合部16も同様に扁平部18と凹部19を設け、両管9、10をロウ材12を介して接合するものである。ここで、給湯管9である下管が風呂管10である上管よりも径が大きいので溶けたロウ材12が接合部16へまわるとともに、上下両管9、10を変形することで接合部16の接合長さを大きくすることが可能である。両管内部の流体同士の熱伝達は、接合部16の間隙が40 μ m程度であり、管及びロウ材の材質が銅で流体が水であるなら、滞留している水の熱伝達率の方が圧倒的に悪いので、ロウ材の有無による伝熱阻害はさほど問題とならない。

【0031】従って、図8の構成で、例えば給湯は行わずに風呂運転を行った場合、バーナ7から給湯管9に加熱される熱量は従来例と同じであるが、給湯管9と風呂管10とのロウ材12を介して確実に接触でき接合部16の長さも確実に長くできる。さらに風呂管10の管の径を給湯管9の管の径より小さくし、遮熱穴14とロウ材穴A13で伝熱量を制限することにより風呂管10の管の受熱量を制御し管内流速を速めることで熱伝達率を向上し、昇温した給湯水が両管9、10の接触領域を通じて風呂水へ放熱する。その放熱量は従来の構成より増えることとなる。従って、給湯水の昇温は抑制され、燃

焼量が増加しても流体が沸騰することはなくなる。

【0032】つまり、二つの機能のうち一つ機能のみを使っている状態で、滞留している流体の昇温は抑制されるため、両管9、10のスケール発生防止と熱交換器の延命化を図ることができる。また、滞留している流体の温度上昇に伴って、バーナ7の出力を制限する必要もなく、装置の性能が十分に発揮でき、ユーザーに与えていた不快感は解消される。

【0033】さらに、図8のような流体回路の構成にしたことによって、以下のような効果が得られる。従来の構成に比較して、給湯管と9と風呂管10の高さが共に低くなるため、缶体8のコンパクト化が実現される。缶体8がコンパクトになれば、燃焼ガスの排気抵抗が低減されるため、バーナ7のコンパクト化も可能となる。また、管断面の接合部16の長さを圧力的に長くできるため上下両管同士の伝熱量を増加でき、両管9、10に接する伝熱フィン11の高温部が減るため、伝熱フィン11の酸化が抑制される。従って、伝熱フィン11の耐久性と信頼性が向上する。

【0034】また、上下両管9、10はロウ材12を介して接触しているため、どちらか一方の流体回路が熱膨張しても、ロウ材12が他方の管に伝わる応力を緩和する。従って、過度の熱応力が加わる運転条件でも柔軟に管が変形するため、缶体8の割れが防止できると共に、耐久性も向上する。

【0035】なお、図8において、接合部16の断面形状が扁平部18と凹部19の形に変形させた一例であるが、この形状の限りではなく、例えば、図9に示すように凹凸の波形であっても同様の効果が発揮できる。

【0036】図8、図9に示したように、本実施例では円形管をプレス成形や引き抜き加工管や押し出し加工管でも断面形状を変形させての流体回路は製造可能である。

【0037】また、給湯管9と風呂管10の接合をロウ材12が棒状の物を使用し毛細管現象で行う例を示したが、接合部16に予めロウ材を塗布していたり、ロウシートを設けたり、棒状ロウ材を設けておいても接合は可能である。

【0038】図8の構成において、上下一対の流体回路の下部を給湯管9、上部を風呂管10としているが、下部を暖房温水回路としても同様の効果が得られる。

【0039】また、本実施例では、本発明を給湯風呂装置に適用した例で説明したが、給湯暖房装置、暖房風呂装置にも適用できる。

【0040】（実施例3）図10、図11は本発明の実施例3であり、本発明のフィンパイプ構成を示したものである。本発明の目的と効果は、実施例1で示したものと同じであり、本実施例と実施例1もしくは実施例2との構成における違いは、二つの異なる流路を給湯流路20と風呂流路21とし、両流路を一枚の隔壁22で隔て

た構成としていることである。

【0041】なお、実施例1と同一符号のものは同一構造を有し、説明は省略する。図10、図11の構成において、給湯流路20と風呂流路21を隔てる隔壁22の形状は凹型とするものである。ここで、下側の給湯流路20が上側の風呂流路21の面積よりも大きくしている。両流路の間隔は隔壁22の板厚のみであるため、管同士のロウ接合と比較し熱伝達距離が短くできる。

【0042】従って、図10、図11の構成で、例えば給湯は行わずに風呂運転を行った場合、バーナ7から給湯流路20に加熱される熱量は従来例とほぼ同じであるが、給湯流路20と風呂流路21は隔壁22を介して隣接しており、さらに風呂流路21の面積を給湯流路20より小さくし、遮熱穴14とロウ材穴A13で伝熱量を制限することにより風呂流路21の受熱量を制御し管内流速を速めることで熱伝達率を向上し、昇温した給湯水が隔壁22のみを通じて風呂水へ放熱する。その放熱量は従来の構成より増えることとなる。従って、給湯水の昇温は抑制され、燃焼量が増加しても流体が沸騰することはない。

【0043】つまり、二つの機能のうち一つの機能のみを使っている状態で、滞留している流体の昇温は抑制されるため、両管9、10のスケール発生防止と熱交換器の延命化を図ることができる。また、滞留している流体の温度上昇に伴って、バーナ7の出力を制限する必要もなく、装置の性能が十分に発揮でき、ユーザーに与えていた不快感は解消される。

【0044】さらに、図10、図11のような流路の構成にしたことによって、以下のような効果が得られる。また従来の構成に比較して、給湯流路20の高さが低くなるため、缶体8のコンパクト化が実現される。缶体8がコンパクトになれば、燃焼ガスの排気抵抗が低減されるため、バーナ7のコンパクト化も可能となる。また、両流路20、21間の伝熱量の増加に伴い、両流路20、21に接する伝熱フィン11の高温部が減るため、伝熱フィン11の酸化が抑制される。従って、伝熱フィン11の耐久性と信頼性が向上する。

【0045】なお、図10、図11で示した断面形状は一例であり、この形状の限りではなく、例えば、図8や図9の接合部16の形状であっても同様の効果が発揮できる。

【0046】図10、図11の流路は、引き抜き加工管や押し出し加工管で製造可能である。

【0047】図10、図11の構成において、両流路の下側を給湯、上側を風呂としているが、下側を暖房温水回路としても同様の効果が得られる。

【0048】また、本実施例では、本発明を給湯風呂装置に適用した例で説明したが、給湯暖房装置、暖房風呂装置にも適用できる。

【0049】

【発明の効果】以上の説明から明らかなように、本発明の熱交換装置によれば、次の効果が得られる。

【0050】(1)二つの異なる流体回路を上下一対にして、伝熱フィンを貫通させた熱交換器であって、上下一対の流体回路の下管の接合部を凹型に変形することで上管と下管との間の伝熱効率を向上している。このような形状により、仮にロウ接合する際、重力と毛細管現象とで接合部にロウ材が非常にまわりやすく、確実に接合できるとともに、下管の機能を使用する際に上管の熱を下管に伝熱し上管の沸騰を防止できる。また、上管の機能を使用する際に下管の熱を上管に伝熱し下管の沸騰を防止できる。すなわち、二つの機能のうち一つの機能のみを使っている状態で燃焼量が増大しても、使用しない機能の流体の沸騰を防止することができる。

【0051】この効果により、スケールの発生防止と熱交換器の延命化が実現されるとともに、装置の持つ性能が十分に発揮され、ユーザーに与えていた不快感は解消される。さらに、缶体と燃焼部のコンパクト化が実現され、伝熱フィンの酸化が抑制されることで、伝熱フィンの耐久性と信頼性が向上する。また、熱交換器に過度の熱応力が加わる運転条件でも柔軟に流体回路が変形するため、缶体の割れが防止できると共に、耐久性も向上する。

【0052】(2)下管の凹型をした接合部に上管の下弦が合致することにより接合部の接触領域を広くでき伝熱効率を大きくでき、仮に上管に丸管を使用するならば上管の配管が従来手法のままで容易に行える。また、ロウ接合する際接合部にロウ材がまわりやすく確実に接合できるとともに、二つの機能のうち一つの機能のみを使っている状態で燃焼量が増大しても、使用しない機能の流体の沸騰を防止することができる。

【0053】この効果により、スケールの発生防止と熱交換器の延命化が実現され、高効率で信頼性の高い装置が提供できる。また、装置の持つ性能が十分に発揮され、ユーザーに与えていた不快感は解消される。さらに加えて、缶体と燃焼部のコンパクト化が実現され、伝熱フィンの酸化が抑制されることで、伝熱フィンの耐久性と信頼性が向上する。また、熱交換器に過度の熱応力が加わる運転条件でも柔軟に流体回路が変形するため、缶体の割れが防止できると共に、耐久性も向上する。

【0054】(3)上管の径が下管の径より小さくすることで上方側から流れてくるロウ材が接合部に導入されやすく、かつ重力と毛細管現象により良好な接合を実現できる。また、上管の機能が小流量ですむとき、上管の径を小さくすることで、上管内の流速を速めることができるため下管から上管への伝熱量を増加でき下管内の流体の沸騰を防止することができる。

【0055】この効果により、スケールの発生防止と熱交換器の延命化が実現され、高効率で信頼性の高い装置が提供できる。また、装置の持つ性能が十分に発揮さ

れ、ユーザーに与えていた不快感は解消される。

【0056】さらに、上管が円形であることから管内圧力損失を最小限にすることができ、下管に大流量の流体を容易に流すことが可能となる。

【0057】(4) 上管の周囲に遮熱部を設けることで下管の機能を使用する際、上管のフィンからの受熱を遮熱部により遮熱することができ、上管内の流体の沸騰を防止することができる。

【0058】この効果により、風呂管内のスケールの発生防止と熱交換器の延命化が実現され、高効率で信頼性の高い装置が提供できる。また、装置の持つ性能が十分に発揮され、ユーザーに与えていた不快感は解消される。

【0059】(5) 上下一対の流体回路の接合部を凹凸型で接合することで上下両管の接触面積を大きく伝熱量を増加させることができる。また、上管の径が下管の径より小さくすることで上方側から流れてくるロウ材が接合部に導入されやすく良好な接合を実現できる。また、上管の機能が小流量ですむとき、上管の径を小さくすることで、上管内の流速を速めることができるため下管から上管への伝熱量を増加でき下管内の流体の沸騰を防止することができる。二つの機能のうち一つの機能のみを使っている状態で燃焼量が増大しても、使用しない機能の流体の沸騰を防止することができる。

【0060】この効果により、スケールの発生防止と熱交換器の延命化が実現されるとともに、装置の持つ性能が十分に発揮され、ユーザーに与えていた不快感は解消される。さらに、缶体と燃焼部のコンパクト化が実現され、伝熱フィンの酸化が抑制されることで、伝熱フィンの耐久性と信頼性が向上する。また、熱交換器に過度の熱応力が加わる運転条件でも柔軟に流体回路が変形するため、缶体の割れが防止できると共に、耐久性も向上する。

【0061】(6) 上下一対の流路を凹型をした隔壁を介して一つの管で構成することで上下両流路の間の距離が最短となりまた接触面積を大きくすることが可能となり伝熱量を増加している。また、上側流路の機能が小流量ですむとき、上管の径を小さくすることで、上側流路内の流速を速めることができるため下側流路から上側流

路への伝熱量を増加でき下側流路内の流体の沸騰を防止することができる。二つの機能のうち一つの機能のみを使っている状態で燃焼量が増大しても、使用しない機能の流体の沸騰を防止することができる。

【0062】この効果により、スケールの発生防止と熱交換器の延命化が実現されるとともに、装置の持つ性能が十分に発揮され、ユーザーに与えていた不快感は解消される。さらに、缶体と燃焼部のコンパクト化が実現され、伝熱フィンの酸化が抑制されることで、伝熱フィンの耐久性と信頼性が向上する。また、熱交換器に過度の熱応力が加わる運転条件でも柔軟に流体回路が変形するため、缶体の割れが防止できると共に、耐久性も向上する。

【図面の簡単な説明】

【図1】本発明の実施例1の熱交換装置のフィンパイプ断面図

【図2】同フィンパイプの拡大断面図

【図3】同フィンパイプの全体構成を示す斜視図

【図4】同フィンパイプの別の拡大断面図

【図5】同フィンパイプの更に別の拡大断面図

【図6】同フィンパイプの他の拡大断面図

【図7】同フィンパイプの更に他の拡大断面図

【図8】本発明の実施例2の熱交換装置のフィンパイプ拡大断面図

【図9】同フィンパイプの別の拡大断面図

【図10】本発明の実施例3の熱交換装置のフィンパイプ拡大断面図

【図11】同フィンパイプの別の拡大断面図

【図12】従来の熱交換装置のフィンパイプ拡大断面図

【符号の説明】

6 熱交換器

7 燃焼部

9 下方側流路

10 上方側流路

11 伝熱フィン

12 ロウ材

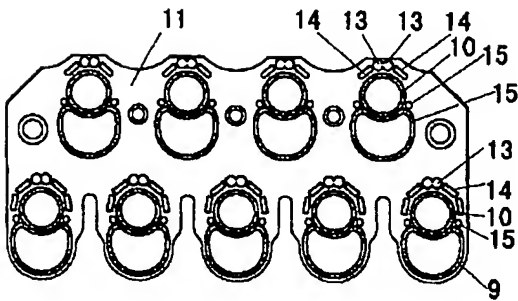
14 遮熱部

16 接合部

22 隔壁

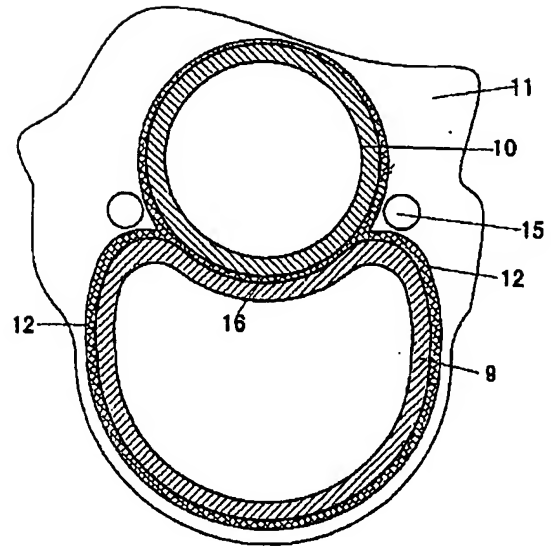
【図1】

- 9 下方側流路
 10 上方側流路
 11 伝熱フィン
 14 遮熱部



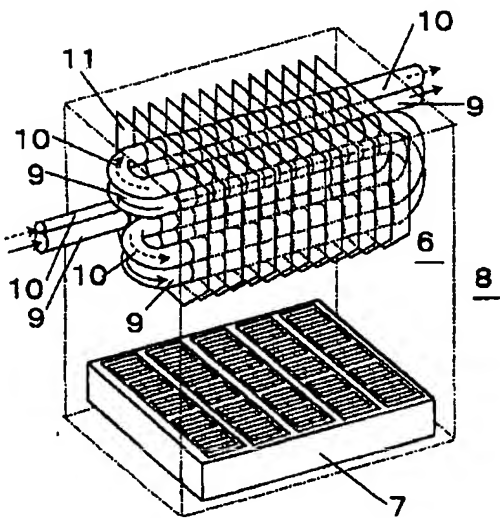
【図2】

- 12 ロウ材



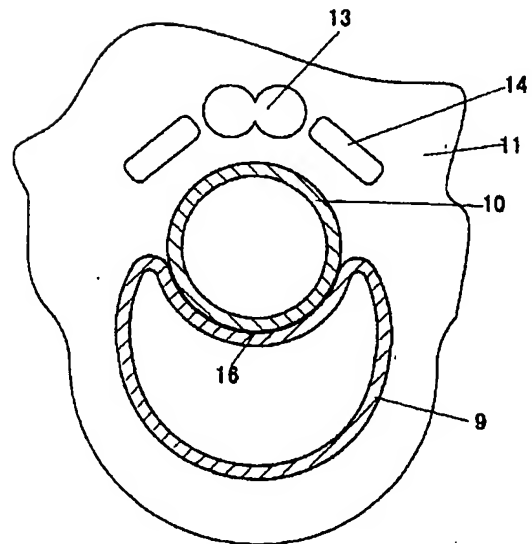
【図3】

- 6 熱交換器
 7 燃焼部

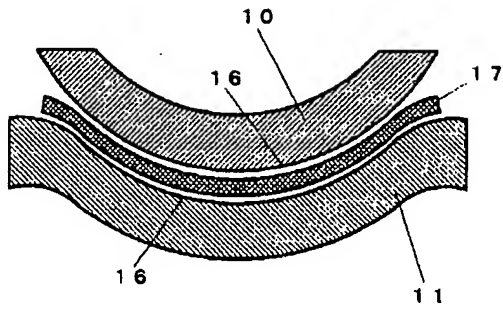


← 給湯水の流れ
 ← 風呂水の流れ

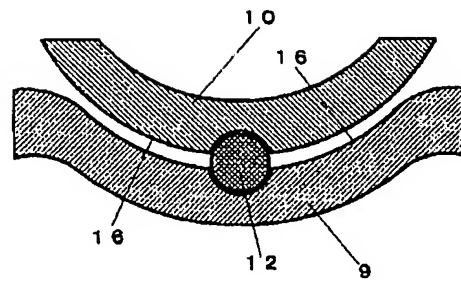
【図4】



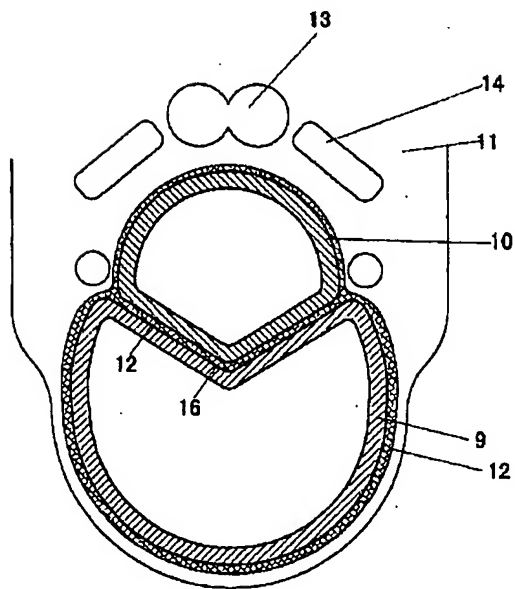
【図5】



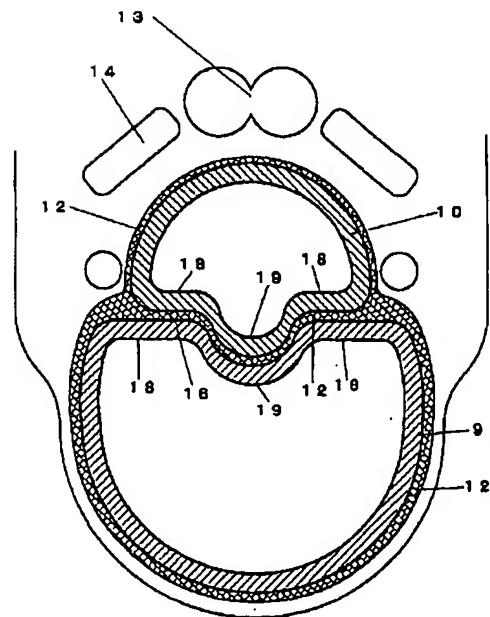
【図6】



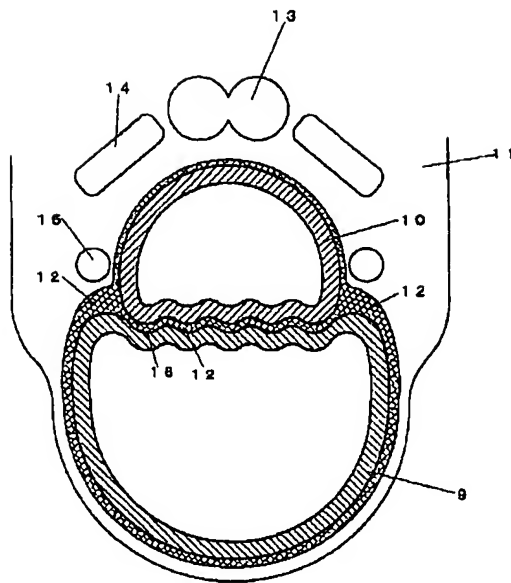
【図7】



【図8】

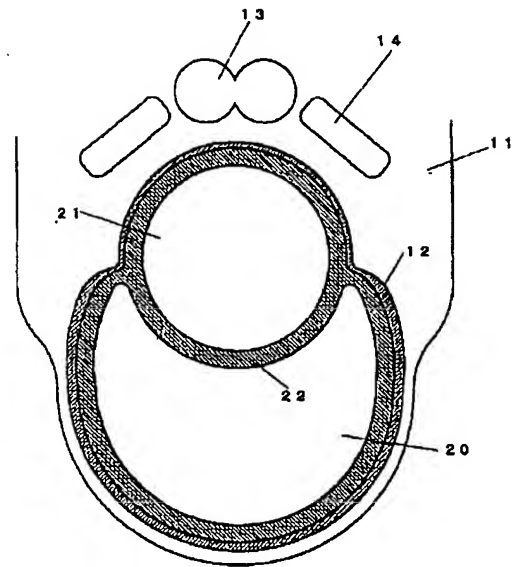


【図9】

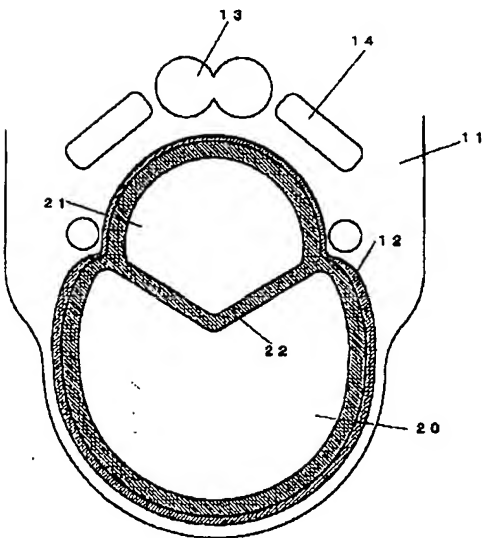


【図10】

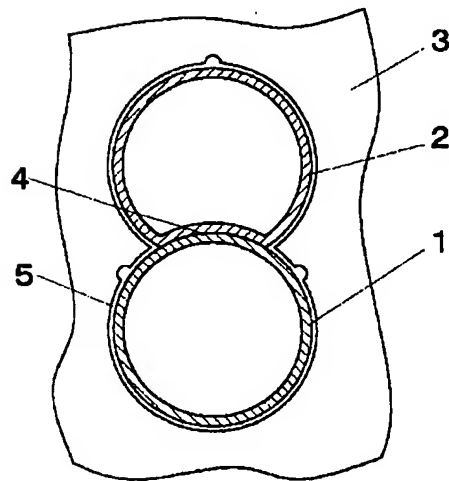
20 拾湯流路
21 風呂流路
22 隔壁



【図11】



【図12】



フロントページの続き

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